



PROFESSIONAL PROFILE



Sara S. Redding, MS, PG, LSRP

Principal Hydrogeologist

CONTACT INFORMATION

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402 Heron Drive
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EDUCATION

MSc, Geological Sciences,
Geophysics Group,
University of Oregon, 2012
ScB, Geology, Math/Physics,
Environmental Track,
Brown University, 2009

PROFESSIONAL LICENSES

NJ Licensed Site Remediation
Professional License #973439
PA Professional Geologist

EXPERIENCE SUMMARY

Over a decade of experience in environmental remediation, characterization and remediation of petroleum, chlorinated solvents, polycyclic aromatic hydrocarbons (PAHs), metals, light and dense non-aqueous phase liquid (LNAPL and DNAPL), as well as assessment of vapor intrusion conditions and emerging contaminants (i.e., PFAS, 1,4-dioxane). Mrs. Redding has conducted, managed, or overseen numerous investigations and remediations for a variety of state and federal programs, including Pennsylvania with Act 2 and Hazardous Sites Cleanup Act (HSCA) projects, as well as New Jersey Industrial Site Recovery Act (ISRA) and Spill Act. She is a Licensed Site Remediation Professional (LSRP) in New Jersey and Professional Geologist (P.G.) in Pennsylvania.

- Roux, Principal Hydrogeologist, 2013 – Present; Geographic Information System (GIS) and Database Manager for New Jersey Operations, 2017 – Present.
- University of Oregon, Graduate Student Researcher/Teaching Fellow, 2009-2012.
- Brown University, NASA Spacegrant Undergraduate Researcher, 2009; Undergraduate Researcher/Laboratory Teaching Assistant, 2006-2008.

TECHNICAL SPECIALTIES

In addition to design and implementation of environmental investigation and remediation, Ms. Redding has experience with environmental forensics, fingerprinting, apportionment, cost-to-closure estimates, and third-party review. Mrs. Redding specializes in navigating the ISRA process, management of sites with complex hydrogeologic settings including multi-aquifer systems and fractured bedrock, management of sites with complex data management and data evaluation needs. Mrs. Redding leads the GIS and Database department for Roux's NJ operations.

REPRESENTATIVE PROJECTS

NJ LSRP

- Evaluation of ISRA applicability for single operation and multi-tenant properties, leveraging historical directories, NAICS and SIC code crosswalks, and site-specific hazardous substance inventories. Developed and executed cost-effective, stepwise approaches for screening large property portfolios, minimizing client costs while ensuring compliance. Produced concise summary of considerations for transaction-readiness.
- Preparation of approvable De Minimis Quantity Exemption (DQE) affidavits resulting in ISRA compliance for a range of operations.
- Preparation and filing of General Information Notices (GINs) and Remediation Certifications (RCs) with corresponding Remediation Funding Sources (RFS) including establishment of Remediation Trust Fund (RTF), Letters of Credit, Self-Guarantee Applications, and Surety Bonds. Filings have included both Leasehold and Entire Site ISRA Industrial Establishments and transactions including sale of property, sale of business, stock transfers, etc. for both operators and property owners.
- Responsible for completing Preliminary Assessment (PA) and Site Investigation (SI) with Receptor Evaluation (RE), Remedial Investigation (RI), and Remedial Action (RA), evaluation of changes in remediation standards and contaminants of emerging concern as applicable for each Site within regulatory timeframes. Successful closure of cases with Response Action Outcomes (RAOs) in various phases of remediation ranging from the initial PA phase (i.e., as a "clean PA") to RA following issuance of Remedial Action Permits (RAPs).

- Documented submissions include well searches, public notification, key phase document preparation and submittal (e.g., PA, SI, RI, and RA), remedial action work plans (RAWPs), soil erosion and sediment control plans (SESCs), off-site source investigation documentation, initial RAP applications for soil and groundwater, RAP modifications for both entity address changes and alteration of final remedies (e.g., extension of groundwater Classification Exception Areas [CEA] and cap modifications), RFS/FA cost estimate review documentation, and Full Laboratory Data Deliverables (FLDDs). Experience includes management of projects within Pinelands and Highlands areas.
- Regularly provides support to projects with compliance attainment needs using methodologies including but not limited to compliance averaging via arithmetic mean, ProUCL, and Thiessen polygons (spatially-weighted average) in accordance with NJDEP's Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria for compliance with the standards promulgated under N.J.A.C. 7:26D and related guidance documents.
- Fluent in application of Alternative Remediation Standards (including Synthetic Precipitation Leaching Procedure [SPLP] and vapor intrusion alternative screening levels), background demonstrations, and working within the requirements for Class I-PL, Class IIA (default Groundwater Quality Standards), Class IIIA, and Class IIIB groundwater classifications.

NJ LSRP – ISRA

- LSRP for portfolio of ten Sites related to concrete manufacturing throughout central and northern New Jersey regulated under ISRA. Individual Site complexity factors include but are not limited to active ISRA, Spill Cases, and Remedial Action Permits (RAPs) related to prior owners and/or operators, access coordination, extensive prior historical investigation, proximity to local superfund contamination, coordination with NJDEP related to establishment or merger of Program Interest Numbers based on available tax information, successful application for regulatory timeframe extension due to access-related delays, and considerations for Leasehold versus Entire Site ISRA Industrial Establishments.
- LSRP for an organic chemical manufacturing facility Site in northern New Jersey regulated under ISRA due two distinct transactions (i.e., sale of property and cessation of operations at different times). Submittal of Preliminary Assessment Report (PAR) and Remediation in Progress (RIP) Waiver Application resulted in NJDEP-issuance of RIP Waivers for both cases.
- LSRP/project manager for a former research and design testing Site in central New Jersey regulated under ISRA. Project responsibilities include implementation of management of soil, sediment, and surface water investigations with an Ecological

Risk Assessment (ERA) component to delineate the extent of SVOCs and metals for active remediation. Activities managed at Site included extensive soil investigation in support of both delineation and Historic Fill determination, remedial design, and complex permitting requirements due to proximity to the Delaware and Raritan Canal. Responsibilities included participation in client and regulatory agency meetings; preparation of proposals & cost estimates, budget tracking; historic document tabulation and presentation; design of soil boring and monitoring well installation program; fieldwork management; preparation of key phase deliverables necessary to meet the regulatory timeframes and support remedial design; management of remedial timeframes and successful application for extensions to regulatory and mandatory timeframes; management of complex permitting requirements (i.e., New Jersey Right-of-Entry, New Jersey Division of Land Use Regulation, US Army Corps of Engineers, Delaware & Raritan Canal Commission, State Historic Preservation Office, Soil Conservation District, and NJDEP's Bureau of Solid Waste). Remedial activities included remediation of Site soil and sediment via bank stabilization and excavation where materials were subject to off-site disposal and use as alternative fill, capping, institutional control (i.e., Deed Notice). A Remedial Action Permit (RAP) for Soil was successfully obtained, resulting in closure of Site soil.

- LSRP/project Manager for a former industrial manufacturing Site in central New Jersey regulated under ISRA. Project responsibilities include coordination and management of soil, sediment, surface water and groundwater investigations to delineate the extent of chlorinated VOCs (primarily PCE and TCE), and remediation of impacted soil. Field activities implemented or overseen at this Site included installation and sampling of bedrock and overburden monitoring wells, groundwater sampling, long-term groundwater monitoring, short-term aquifer testing, long-term groundwater elevation monitoring, installation of GORE (now AGI) vapor modules, extensive installation of soil borings and soil sampling/delineation, remediation of impacted soil using excavation methods, vapor intrusion sampling; and long-term groundwater monitoring in support of a Monitored Natural Attenuation (MNA) remedy for groundwater. Complexity factors include extensive tabulation of historic documents, groundwater contamination in fracture bedrock system, and NJDEP technical consultation for variance to delineation requirements due to physical access considerations. This Site received full soil closure and is currently undergoing post-remediation sampling to support groundwater closure while the RAP-GW application submitted for compliance with the August 3, 2025 groundwater remediation standards phase-in is reviewed by NJDEP.

- LSRP/project manager for dormant industrial facility subject to ISRA compliance. Responsibilities included support managing environmental risk for demolition of dormant asphalt plants and manufacturing operations including pre-demolition planning, regulatory permitting support (e.g., Upland Waterfront Development, Flood Hazard Area, SHPO), management of stakeholder communications between property owners, tenants, regulatory agencies, and demolition contractors. Considerations for demolition including addressing asbestos-containing building materials (ACM), lead-based paint, stored hazardous materials, and compliance with NJDEP and local requirements.

NJ LSRP – Spill Act

- LSRP/project manager for an LNAPL spill case identified at a former research and design testing Site in central New Jersey. Project responsibilities include coordination and management of soil and groundwater investigation related to petroleum product which fingerprints as diesel, paint thinner and coal tar. Activities included implementation of Interim Remedial Measures (IRM) and soil/groundwater investigation concurrent with ongoing remediation under ISRA. Responsibilities include preparation of cost to closure estimates for client, design of soil boring and monitoring well installation program; evaluation of downhole geophysical logs in fractured bedrock for well screen placement; fieldwork management; preparation of key phase deliverables necessary to meet the regulatory timeframes and support remedial design. To date, NJ deliverables have included LNAPL IRM Report, IRE, and Public Notification submittals.
- LSRP/project manager for an LNAPL spill case identified at wet batch concrete manufacturing facility in northern New Jersey. Project responsibilities include coordination and management of soil, groundwater, and vapor intrusion investigation related to petroleum product which are a mixture of diesel and No. 6 Fuel Oil. Activities have included preparation and submittal Interim Remedial Measures (IRM) Report and ongoing management of soil/groundwater investigation. Remedial investigation activities rely on historic document tabulation and presentation, design of soil boring and monitoring well installation program, Historic Fill assessment, preparation of deliverables necessary to meet the regulatory timeframes and support remedial design.
- Project manager for spill case at commercial and research and development Site in northern New Jersey resulting from petroleum impact identified during demolition of wastewater treatment plant (WWTP). Project responsibilities included preparation and submittal of Remedial Investigation and Remedial Action Reports (RIR/RAR) supportive of Response Action Outcomes (RAO-A). Further responsibilities included

preparation of satisfactory response to NJDEP audit of case RAO. This case has now received full closure.

- Project manager for spill case at commercial and research and development Site in northern New Jersey resulting from identification of tetrachloroethene (PCE) and 1,4-dioxane were identified above NJDEP GWQS. Project responsibilities included design and management of bedrock groundwater investigation and unknown soil source investigation, use of passive soil gas screening survey to refine area subject to soil sampling, and preparation/submittal of RIR/RAR supportive of Remedial Action Permit (RAP) for Groundwater.

NJ LSRP – PFAS

- LSRP and/or project manager for multiple industrial facilities in New Jersey regulated under ISRA with potential per- and poly-fluorinated substances (PFAS) usage and/or discharge of Aqueous Film Forming Foam (AFFF). Operations vary and include but are not limited to chemical manufacturing with former paint manufacturing operations, pharmaceutical manufacturing, and current or historical plastic manufacturing via both blow molding and production of thin sheets.
- Project management for southern New Jersey manufacturing facility with known AFFF discharge. Site is located within a Class IIIA aquifer and adjacent to a water body classified as both freshwater non-trout (FW2-NT) and saline (SE2). Responsibilities include evaluation of proximate potential alternate sources of PFAS, design and implementation of PFAS investigation in soil, groundwater, and surface water compliant with evolving regulatory requirements.
- Project manager for ISRA-subject northern New Jersey manufacturing facility utilizing PFAS substances. Long history of historical manufacturing by other unrelated entities which may have included PFAS usage as well as significant AFFF discharges on adjacent property due to fire required consideration during design of the SI sampling. Consideration of total PFAS concentrations as well as other forensic methods was required during subsequent data analysis.
- Completion of contaminants of emerging concern (CECs) assessment at all Sites where retained, including ISRA and Spill Act Sites as well as Sites subject to Remedial Action Permit (RAP) requirements for soil and groundwater. Evaluation for the potential presence of CECs at these Sites has require evaluation of multiple lines of evidence (e.g., industry handling sector lists, historical operations, Safety Data Sheets, Community Right-to-Know documentation, etc.) to determine whether sampling of CECs, including PFAS, is warranted.

NJ LSRP – Remedial Action Permitting

- LSRP retained for five Remedial Action Permit (RAP) cases, including soil and groundwater permits. Project responsibilities include coordination with NJDEP, submittal of

biennial certifications related to each permit, evaluation of contaminants of emerging concern, submittal of multiple RAP Modification Applications, submittal of RAP Property Ownership Transfer Applications, and compliance with permit timeframes. Individual Site complexity factors have included coordination with off-site LSRPs and Persons Responsible for Conducting Remediation (PRCRs) related to investigations entering permitted property, technical consultation with NJDEP, inclusion of potable wells in Ground Water Monitoring Plan (GWMP), cap disturbance management, Class I-PL aquifer designation, and management of RAP concurrently with other investigations ongoing at the Site.

- LSRP of record for historical petroleum-related spill case where submittal of Groundwater RAP Termination Application by LSRP resulted in issuance of RAP Termination by NJDEP for Site closure. Included communication with NJDEP, including negotiation of reduced Groundwater Monitoring Plan (GWMP) with NJDEP due to damaged/lost wells and closure of these wells in accordance with NJDEP's Bureau of Water Allocation (BWA) guidance.

Pennsylvania (Act 2)

- Project manager for remedial investigation of soil, groundwater, vapor intrusion (VI), surface water and sediment at a former stainless steel tubing manufacturing facility located in Southeast Pennsylvania (site is managed under HSCA by the Environmental Cleanup Program). The investigation focused on the vertical and horizontal delineation of chlorinated solvents in overburden and bedrock. Investigation activities included the installation of shallow overburden and deep (~400 feet) nested bedrock monitoring wells using sonic drilling techniques to reduce the amount of investigative derived waste (IDW) generated. The use of sonic drilling techniques resulted in an overall cost savings for the client. Additional activities included management of over 30 years of laboratory analytical data, geophysical and packer testing of open boreholes to determine well screen intervals, slug testing, installation of GORE (now AGI) vapor modules, indoor air sampling, VI assessment using USEPA risk calculator, assessment of surface water and sediment in a local tributary for both human health and ecological risk considerations, assessment of potential groundwater diffuse discharge and point-source discharges to this tributary, on-site soil investigation, bacterial sampling, treatability study long-term parameter monitoring, long-term groundwater elevation monitoring, DNAPL investigation, PDB groundwater sampling, and groundwater sampling for volatile organics, metals, 1,4-dioxane, PFAS, monitored natural attenuation indicator parameters, and compound-specific isotope analysis (CSIA) parameters. Responsibilities include preparation for and participation in client meetings; preparation of proposals & cost estimates; coordination with

insurance carriers; historic document tabulation and presentation; health and safety management; supplemental remedial investigation strategy support; fieldwork and staff management. Activities were summarized in a comprehensive remedial investigation report (RIR) and supplemental RIR covering an investigation period of over 30 years, a Treatability Study Completion Report discussing the effectiveness of molasses injections for addressing overburden and deep bedrock groundwater contamination, and a Feasibility Study (FS) Report assessing multiple assembled integrated remedial alternatives including ISCO and ISCR injections, hydraulic control, and best management practices. This project included regular communications with PADEP by way of progress reports, response letters, reports, participation in public meetings, and sharing of data.

- Various regulatory support in Pennsylvania including preparation of documents based on communication with the state and federal regulators on behalf of clients. Documented submissions include, feasibility study work plans, request for Non-Use Aquifer determinations, public notification, remedial phase reports, quarterly monitoring reports (i.e., Remedial Action Progress Reports), and remedial action completion reports.

Due Diligence

- Conduct Phase I Environmental Site Assessment (ESA) and/or Preliminary Assessment for real estate and industrial clients in New Jersey, Pennsylvania, and New York.
- In addition to typical industrial and commercial facilities, Phase I ESA/PA support has included Sites with extensive wooded areas or quarry areas, historical agriculture, extensive Site history, off-site contamination.

Mine Operations Support

- Provided support to northern New Jersey quarry for NJDEP Bureau of Water Allocation and Well Permitting (BWAWP). Includes preparation of a Water Permit Application (WAP) application to replace the existing Water Use Registration (WUR) for quarry operations. Has required preparation of a water balance, groundwater and surface water diversion requests, coordination with quarry managers to evaluate final extent and elevation of quarry pit relative to water table, evaluation of water management via transfer pumps from the quarry pit to settling basins proximate to sand plant operations to mitigate overall groundwater diversion, and evaluation of consumptive use for quarry operations (i.e., water used in equipment washing, dust suppression, sand plant washing operations, and flocculation in settling basins with additional considerations for evaporation). Additional groundwater considerations include LSRP management of groundwater impacted by volatile organic compounds (VOCs) proximate to

scale house subject to ongoing monitoring. Work on this matter has historically included preparation of aquifer test waiver applications, meetings with BWAWP, preparation of water management strategies to comply with current WUR, preparation for canvassing to evaluate potential adverse effects to other proximate water users, and modeling groundwater withdrawals under both pumping and quarry deepening scenarios.

- Provided support to northern New Jersey quarry demonstrating that overburden material is not subject to known discharges associated with quarry operations and is not proximate to known groundwater impacts.
- Provided support to northern New Jersey quarry operations for evaluation of Naturally Occurring Asbestos (NOA) proximate to mine pit including development of drilling program, health and safety plan, and regulatory assessment for management of mined materials via best management practices (BMPs), and engineering controls (e.g., wetting, dust suppression, PPE, decontamination). Includes consideration for compliance with Mine Safety and Health Administration (MSHA) requirements. Developed and implemented baseline and periodic air monitoring protocols for worker exposure and perimeter monitoring in coordination with Certified Industrial Hygienist (CIH).
- Provided support to southern New Jersey sand mine operations for compliance with township-mandated groundwater monitoring and reporting. Support has historically included replacement of monitoring wells to accommodate mine expansion and groundwater sampling to comply with permit conditions.

Litigation Support

- Served as project manager for responsible party identification and allocation support matter related to CVOCs in bedrock with complexities related to aquifer depth, pumping wells and proximate drycleaner and Superfund sites located in New Jersey.
- Served as project manager for matter requiring preparation of preliminary expert statement for use in mediation. Statement summarized the history of environmental cleanup at a New Jersey Site and evaluation of the current conditions and path to completion for the environmental cleanup of the Site. The statement additionally included assessment of common due diligence protocols and sources of information regarding the assessment of environmental conditions for sites in New Jersey.
- Support expert evaluation of the available operation information and site investigation data in support of fate and

transport analysis to determine the divisibility of the COC contamination among PRPs for New Jersey landfill site.

- Served as project manager in support of expert of insurance litigation matter. Provided support to expert in preparation of settlement cost estimate and for assessment of Site conditions for both soil and groundwater, including free product. Relevant chemicals of concern included petroleum-related constituents formerly stored in six USTs (including heating oil, mineral oil, and benzene) and potential drycleaner-related impacts.
- Served as project manager in support of expert insurance litigation matter. Provided support to expert inclusive of historical document evaluation, Site condition assessment, and review of third-party documents related to remediation costs to support allocation assessment and conceptual remediation cost estimate.
- Serves as project manager for insurance litigation matter which involved a detailed analysis of past costs related to environmental activities at a former steel manufacturer located in Pennsylvania. Analysis included but was not limited to cost characterization, presentation of Site history to insurers, and assessment of cost relative to pertinent coverage dates for various PRP entities.
- Supported evaluation of extent and magnitude of lead and other heavy metals contamination in soils surrounding the lead battery recycling facility. Conducted field team management for expedited residential sampling program. Worked together with expert to support development of interior/exterior assessment and remediation protocols with lead regulatory agency; supported analysis and reporting of community blood lead data; provided support for graphical depiction and statistical analysis of data related to lead in soil.
- Provided support to expert for evaluation of historical operations, soil lead and arsenic data, and chemical signatures of potential industrial sources with locations on and adjacent to the historic industrial manufacturing facilities located in Indiana.
- Provided technical support to expert for preparation of expert report. Support activities included compilation, analysis, and graphical depiction of data for soil, groundwater, indoor air, sub-slab soil gas, and stormwater related to multiple facilities and residences in Ohio. Overcame challenges related to multiple partially-overlapping datasets provided in different formats.
- Provided technical support to expert for evaluation of potential sources of trichloropropane (1,2,3-TCP) groundwater contamination in drinking water wells in California. Support included evaluation of regional groundwater quality and

pumping conditions, graphical depiction of temporal trends, and Principal Component Analysis (PCA).

- Litigation team member for testifying expert in preparation of expert report. Responsibility included managing assessment of environmental liabilities for multiple fertilizer manufacturing facilities, a manufactured gas plant remediation, and multiple facilities impacted by uranium.
- Provided technical support to expert for transition of substantial data and geospatial files for Montana site consultant to internal database for analysis by expert. Support activities included working with expert to identify data needs, communicate with external data managers, conduct assessment of data provided for timing of historical activity, to facilitate generation of graphical depictions.
- General litigation support staff for projects with a significant volume of data. Responsibilities include compilations, assessment, and management of litigation databases related to chlorinated solvents, metals, and PFAS/PFOA. Support includes identifying, digitizing, managing and assessment of analytical data. Support additionally includes evaluation of Site history and surrounding property use for allocation considerations, timing of release, etc.
- Provided technical support on two expert matters related to evaluation of potential correlation between Site operations and sewer infrastructure damage potential caused by pH fluctuations. Support included evaluation of documents, working with expert to identify data needs, assessment of travel time and path given extensive infrastructure maps, and factors related to pipe corrosion in sewer systems.

GIS and Database Departmental Manager for NJ Operations

- GIS and Database program development, interviewing and management of personnel. Management of stored standards for multiple states and general compliance with regulatory program requirements, including New Jersey and Pennsylvania. Regularly coordinates with and provides support for projects in Roux's NY, MA, IL, TX, and CA offices.
- Management of training in use of ESRI's ArcMap version 10.6.1, ESRI's ArcPro transition management, Microsoft Access database management, use of SURFER and Thiessen Polygon tools, and Microsoft Excel for environmental applications.

- Implemented automation of data processing and depiction tasks using macros programmed in Microsoft Excel's VBA to increase efficiency.
- Regularly advise on and implement data-driven assessments for compliance attainment using available tools allowable by regulatory guidance documents (i.e., Site-specific standards including SPLP and background demonstration, ProUCL software, arithmetic mean, and Thiessen Polygon application).

PROFESSIONAL TRAININGS

OSHA 40-Hour/HAZWOPER Health and Safety Training and Basic Orientation Plus Training

PROFESSIONAL AFFILIATIONS

NJ Licensed Site Remediation Professional Association (LSRPA)

PUBLICATIONS

Boudreau, L., Wiest, M., Redding, S. "Why New Phase I Site Standard Matters for Real Estate" *Law 360*, Dec. 2021.

Boudreau, L., Wiest, M., Redding, S. "Enviro Review Standard Tweaks May Clarify Cleanup Liability" *Law 360*, Oct. 2021.

Papamarcos, S., "A Model of Basal Hydrologic Networks and Effective Stress Beneath an Ice Sheet" (Thesis). University of Oregon, Mar. 2012.

PRESENTATIONS

Using Artificial Intelligence in Site Remediation. Presenter: October 2024 Chemistry Counsel of New Jersey (CCNJ).

Using Artificial Intelligence in Site Remediation. Presenter: April 2024 New Jersey Site Remediation Conference (NJ SRC) and August 2024 LSRPA Webinar for professional development credits.

Walk the Line: Avoiding Ethical Pitfalls in Environmental Contamination Cases. Panelist: 2023 Environmental & Emerging Claim Manager Association (EECMA) Conference.

Papamarcos, S., Rempel, A., "A model of basal hydrologic networks, ice-infiltrated sediments, and effective stress" (Presented at AGU, Fall Meeting 2011).

Schultz, P. H., Papamarcos, S., "Evolving Flowfields from the Imbrium and Orientale Impacts" (Presented at LPS Conference 2010).